REMARKS/ARGUMENTS

Upon entry of this Amendment, Claims 1, 2, 4-9, 12, 13, 16-23, 47, 48, 50-55, 58,

59, and 62-101 will be pending in this application. Of these pending Claims, Claims 1,

47, and 92-101 are in independent form. Claims 1 and 47 have been amended, and

Claims 92-101 have been added by this Amendment. Reconsideration and allowance of

all of the pending claims in view of the foregoing amendments and the following

remarks are respectfully requested.

Claim Rejections - 35 U.S.C. § 102

Applicants now address the Examiner's prior art rejection, which Applicants

respectfully traverse. In the September 3, 2004 Office Action, the Examiner has

acknowledged that Claims 6, 8, 29, 52, 54, and 70-75 would be allowable if rewritten in

independent form including all of the limitations of the base claim and any intervening

claims. However, the Examiner rejected remaining Claims 1, 2, 4-9, 12, 13, 16-23, 48,

50, 51-55, 58, 59, 62-69, and 76-91 under 35 U.S.C. § 102(b) as being anticipated by

U.S. Patent No. 5,760,781 to Kaufman et al. ("the '781 Patent"). While the Examiner did

not expressly reject Claim 47 in the Disposition of Claims section in the Office Action

Summary and Par. 1 of the September 3, 2004 Office Action, Applicants presume that

the Examiner has rejected Claim 47 based on his discussion of the claim in Par. 2 of the

Office Action.

Applicants respectfully submit that none of the pending claims in the present

application as amended by this Amendment is anticipated by the '781 Patent, because

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the '781 Patent does not disclose, either expressly or inherently, a three-dimensional

volumetric display for displaying three-dimensional images or a multiplanar frame buffer

for use with a three-dimensional volumetric display.

The '781 Patent is directed to visualization of three-dimensional volumetric data.

(the '781 Patent, at Col. 1, lines 15-19). In Par. 2 of the September 3, 2004 Office

Action, the Examiner took the position that the '781 Patent disclosed a system and

method of processing three-dimensional image data for a three-dimensional volumetric

display having a plurality of display elements. To support this position, the Examiner

identified the term "voxels" used in the '781 Patent as referring to display elements of a

three-dimensional volumetric display. Applicants respectfully disagree.

The '781 Patent uses the term "voxel" to refer to three-dimensional image data

stored in a cubic memory 22. (the '781 Patent, FIGS. 3 and 12; Col. 4, line 3; Col. 6,

lines 22-23 and 64-67). Accordingly, the term "voxel" as used in the '781 Patent is a

data element, not a display element of a three-dimensional volumetric display.

Therefore, it is respectfully submitted that the Examiner's misidentification of "voxels" as

display elements of a volumetric display does not support his position that the '781

Patent teaches a system and method of processing three-dimensional image data for a

three-dimensional volumetric display having a plurality of display elements.

Rather, the '781 Patent only discloses a method and apparatus for generating

three-dimensional volume projection images of an object from a desired viewing

direction. (the '781 Patent, Col. 2, lines 60-66). It is well known in the field of

mathematics and three-dimensional computer graphics that three-dimensional projection

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is "a mathematical process to project a series of 3D shapes to a 2D surface, usually a computer monitor." (WIKIPEDIA, The Free Encyclopedia, at http://en.wikipedia.org/wiki/3D_projection (last visited November 22, 2004)) (emphasis added). In other words, the '781 Patent is directed to generating images of a three-dimensional object on a conventional two-dimensional display that are perceived to be three dimensional on the same basis that a computer screen image may be perceived to be "three dimensional." In contrast, the present invention is directed to display of true three dimensional images occupying a definite volume of three-dimensional space.

More specifically, FIG. 3 of the '781 Patent shows a projection mechanism (RPC) 32, which receives interpolated voxel values from an interpolation mechanism 28, combines the interpolated voxel values, and generates a pixel value for each viewing ray. (the '781 Patent, Col. 9, lines 5-9). Each viewing ray corresponds to each pixel of the display screen. (the '781 Patent, Col. 4, lines 14-15). "Preferably, the pixel value signal generated by the projection mechanism 32 is provided to the frame buffer 40 where each pixel value signal is stored, provided to the pixel processor 42 for 2-D transformation, filtering or warping, and thereafter provided to a display device 44 for visual display." (the '781 Patent, Col. 10, lines 29-34) (emphasis added). Another embodiment shown in FIG. 12 of the '781 Patent likewise uses "a pixel processor 42, frame buffer 40, and display device 44 for generating the three-dimensional (3-D) volume projection image." (the '781 Patent, Col. 13, lines 60-63) (emphasis added). Nowhere in the '781 Patent is

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there any disclosure or even suggestion of displaying three-dimensional image on a truly

three-dimensional volumetric display.

Nor does the '781 Patent disclose a multiplanar frame buffer having addressable

memory locations corresponding to pixels of display elements of a three-dimensional

volumetric display. In Par. 2 of the September 3, 2004 Office Action, the Examiner took

the position that the cubic frame buffer 22 of FIG. 3 of the '781 Patent disclosed a

multiplanar frame buffer of the present invention. Applicants respectfully disagree.

FIGS. 3 and 12 of the '781 Patent show that it is a frame buffer 40, not the cubic frame

buffer 22, that stores pixel values for the display device 44. (the '781 Patent, Col. 10,

lines 29-34). The cubic frame buffer 22, coupled to the data acquisition device 23, is

merely a data buffer for storing acquired image data or voxels before the image data

undergoes various processes and interpolations (via one or more two-dimensional

buffers 24) to be stored in the frame buffer 40 and displayed on the display device 44 as

volume projection images. (the '781 Patent, Col. 6, lines 22-48). Furthermore, nowhere

in the '781 Patent is there any teaching or even suggestion that this frame buffer 40

could be a multiplanar frame buffer for storing pixel values for a three-dimensional

volumetric display. Accordingly, it is respectfully submitted that the '781 Patent does not

disclose or even suggest a multiplanar frame buffer for a three-dimensional volumetric

display.

On the other hand, the present invention is directed to generation of

three-dimensional images using a truly three-dimensional volumetric display, such as a

multiplanar volumetric display system, in which the images occupy a definite volume of

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three-dimensional space and are projected onto multiple display elements arranged in the depth direction. The present invention also requires a multiplanar frame buffer having addressable memory locations corresponding to pixels of display elements of the three-dimensional volumetric display.

To further emphasize these aspects of the present invention, independent Claims 1 and 47 have been amended to further clarify the relation between display elements of a three-dimensional volumetric display and memory locations in a multiplanar frame buffer. Thus, independent Claims 1 and 47, as amended herein, require a three-dimensional volumetric display and a multiplanar frame buffer for displaying three-dimensional images on the three-dimensional volumetric display. As shown in the foregoing discussion, the '781 Patent does not teach nor suggest a three-dimensional volumetric display, or a multiplanar frame buffer for a three-dimensional volumetric display.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently, in a single prior art reference. (*See* MPEP 2131). Since the '781 Patent does not disclose, either expressly or inherently, a three-dimensional volumetric display and a multiplanar frame buffer for use with a three-dimensional volumetric display, Applicants respectfully submit that the '781 Patent cannot anticipate independent Claims 1 and 47 of the present application. Since none of the independent claims pending in the present application is anticipated by the '781 Patent, none of their respective dependent claims is anticipated by the '781 Patent as well.

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Accordingly, Applicants respectfully submit that the '781 Patent does not anticipate any of the pending claims in the present application as amended. It is respectfully requested that this prior art rejection be withdrawn and that all of the pending claims be allowed over the '781 Patent.

Allowable Subject Matter

In Par. 25 of the September 3, 2004 Office Action, the Examiner stated that Claims 6, 8, 52, 54, and 70-75 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. While Applicants respectfully traverse the Examiner's objection to those Claims for the reasons stated above, Applicants have added new independent Claims 92-101, which are Claims 6, 8, 52, 54, and 70-75 rewritten in independent form, respectively, including all of the limitations of the corresponding base claims and any corresponding intervening claims. Accordingly, it is respectfully requested that new Claims 92-101 be allowed.

In light of the foregoing amendments and remarks, Applicants respectfully request that the rejection be withdrawn and that a timely Notice of Allowance with respect to all of the pending claims be issued in this case.

Included herewith is a check in the amount of $486.00 to cover the excess claims fees for a small entity for nine independent claims in excess of three ($396.00) and 10 claims in excess of twenty ($90.00). No additional fees or extensions of time are believed to be due. However, authorization is given hereby to charge Deposit Account

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No. 01-1785 for any deficiency in fees necessary to preserve the pendency of the subject

application, or to credit the same in case of overpayment.

Respectfully submitted,

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